



US010503218B2

(12) **United States Patent**  
**Suzuki et al.**

(10) **Patent No.:** **US 10,503,218 B2**

(45) **Date of Patent:** **Dec. 10, 2019**

(54) **INFORMATION PROCESSING DEVICE AND INFORMATION PROCESSING METHOD TO CONTROL DISPLAY OF IMAGE BASED ON INCLINATION INFORMATION**

(58) **Field of Classification Search**  
CPC ..... G06F 1/1692; G06F 2200/1637; G06F 3/0346; G06F 3/0488  
See application file for complete search history.

(71) Applicant: **SONY CORPORATION**, Tokyo (JP)

(56) **References Cited**

(72) Inventors: **Seiji Suzuki**, Kanagawa (JP); **Yasushi Okumura**, Tokyo (JP); **Yusuke Miyazawa**, Tokyo (JP)

U.S. PATENT DOCUMENTS

7,860,644 B2\* 12/2010 Orr ..... G01C 21/36 340/990

(73) Assignee: **SONY CORPORATION**, Tokyo (JP)

2007/0107068 A1 5/2007 Kelley et al.

(Continued)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

FOREIGN PATENT DOCUMENTS

CN 102265242 A 11/2011  
EP 1667471 A1 6/2006

(Continued)

(21) Appl. No.: **15/621,533**

*Primary Examiner* — Michelle L Sams

(22) Filed: **Jun. 13, 2017**

(74) *Attorney, Agent, or Firm* — Chip Law Group

(65) **Prior Publication Data**

US 2017/0277229 A1 Sep. 28, 2017

**Related U.S. Application Data**

(63) Continuation of application No. 13/295,732, filed on Nov. 14, 2011, now Pat. No. 9,678,543.

(30) **Foreign Application Priority Data**

Nov. 26, 2010 (JP) ..... 2010-263408

(51) **Int. Cl.**

**G06F 1/16** (2006.01)

**G06F 3/0481** (2013.01)

(Continued)

(57) **ABSTRACT**

An information processing apparatus, method and computer program product cooperate to provide a device that changes the way content is displayed depending on an inclination angle of the device. The device includes an inclination acquisition device that acquires inclination information of a display housing that houses a display with a displayed image thereon. A first controller causes a first change to the displayed image according to the inclination information. A second controller causes a second change to the displayed image when a predetermined condition is met with respect to the inclination information. By including subcomponents that cooperate in this manner, the device allows a user to perceive a displayed image at various viewing angles and easily recognize whether certain displayed features are able to be actuated when the device is positioned in a certain inclination angle.

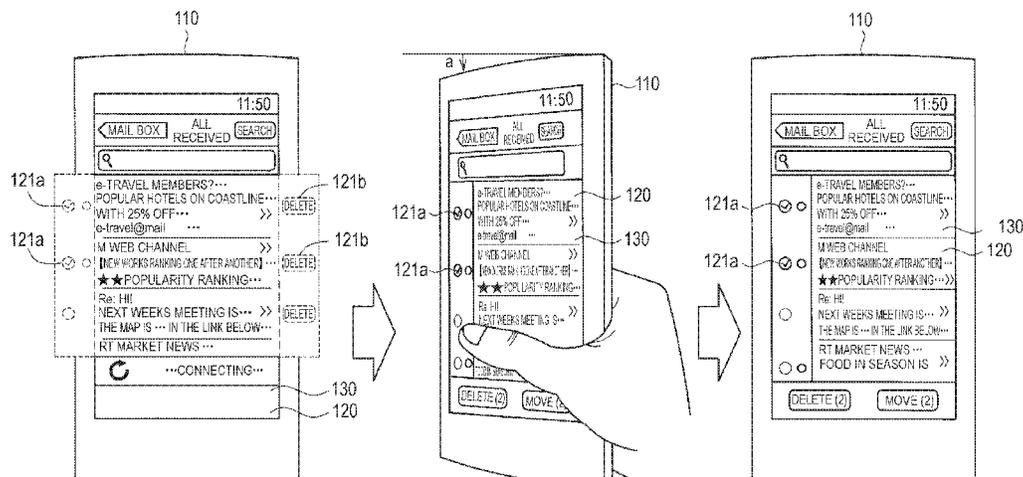
(52) **U.S. Cl.**

CPC ..... **G06F 1/1694** (2013.01); **G06F 3/0482**

(2013.01); **G06F 3/0485** (2013.01);

(Continued)

**4 Claims, 11 Drawing Sheets**



# US 10,503,218 B2

Page 2

(51)	<b>Int. Cl.</b> <i>G06F 3/0482</i> (2013.01) <i>G06F 3/0485</i> (2013.01) <i>G06F 3/0488</i> (2013.01) <i>G06T 19/00</i> (2011.01)				2010/0259610 A1 10/2010 Petersen 2010/0295958 A1 11/2010 Larsson et al. 2010/0299599 A1* 11/2010 Shin ..... G06F 3/0482 715/702 2011/0083089 A1 4/2011 Pahud et al. 2011/0161884 A1* 6/2011 Dugan ..... G06F 1/1626 715/843
(52)	<b>U.S. Cl.</b> CPC ..... <i>G06F 3/0488</i> (2013.01); <i>G06F 3/04815</i> (2013.01); <i>G06F 2200/1637</i> (2013.01); <i>G06T</i> <i>19/006</i> (2013.01)				2011/0314422 A1 12/2011 Cameron et al. 2012/0036433 A1 2/2012 Zimmer et al. 2012/0086629 A1* 4/2012 Thorn ..... G06F 3/0482 345/156 2012/0131458 A1* 5/2012 Hayes ..... H04W 4/21 715/716 2012/0131495 A1 5/2012 Goossens et al. 2013/0007653 A1* 1/2013 Stolyarov ..... G06F 1/1626 715/784
(56)	<b>References Cited</b>  U.S. PATENT DOCUMENTS				
	2009/0197635 A1* 8/2009 Kim ..... G06F 3/0346 455/550.1 2009/0201246 A1* 8/2009 Lee ..... G06F 1/1626 345/156 2009/0225044 A1 9/2009 Jeon et al. 2010/0064259 A1 3/2010 Alexanderovitch et al. 2010/0066763 A1* 3/2010 MacDougall ..... G06F 1/1626 345/656 2010/0138766 A1* 6/2010 Nakajima ..... G06F 1/1626 715/767 2010/0139991 A1* 6/2010 Philipp ..... G06F 3/0418 178/18.06 2010/0214216 A1 8/2010 Nasiri et al.				<b>FOREIGN PATENT DOCUMENTS</b>  JP 2004-334642 A 11/2004 JP 2005-245619 A 9/2005 JP 2008-176641 A 7/2008 JP 2009-009252 A 1/2009 JP 2009-251687 A 10/2009 JP 2010-086192 A 4/2010 JP 2010-109552 A 5/2010

\* cited by examiner

FIG. 1

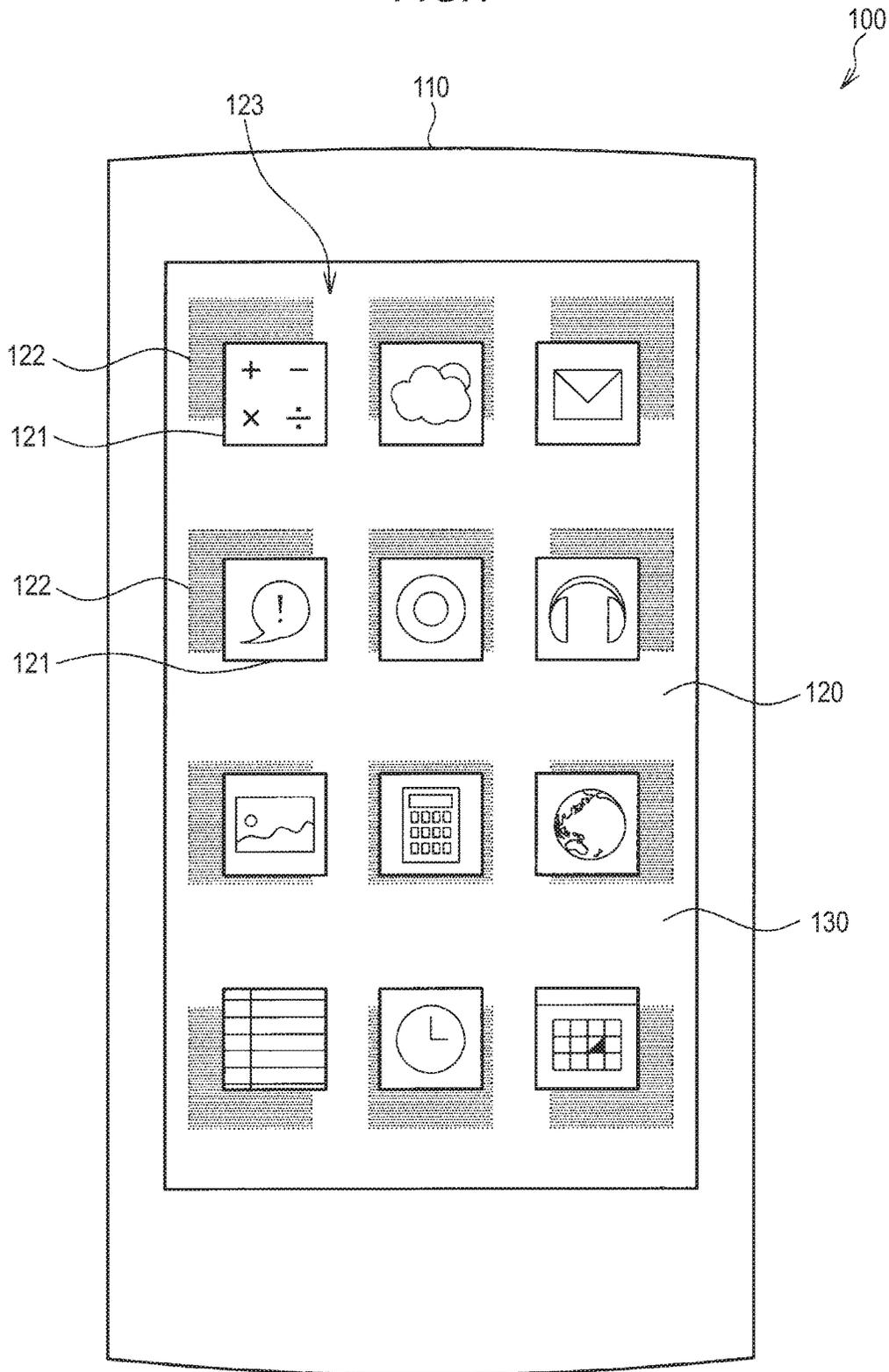


FIG. 2

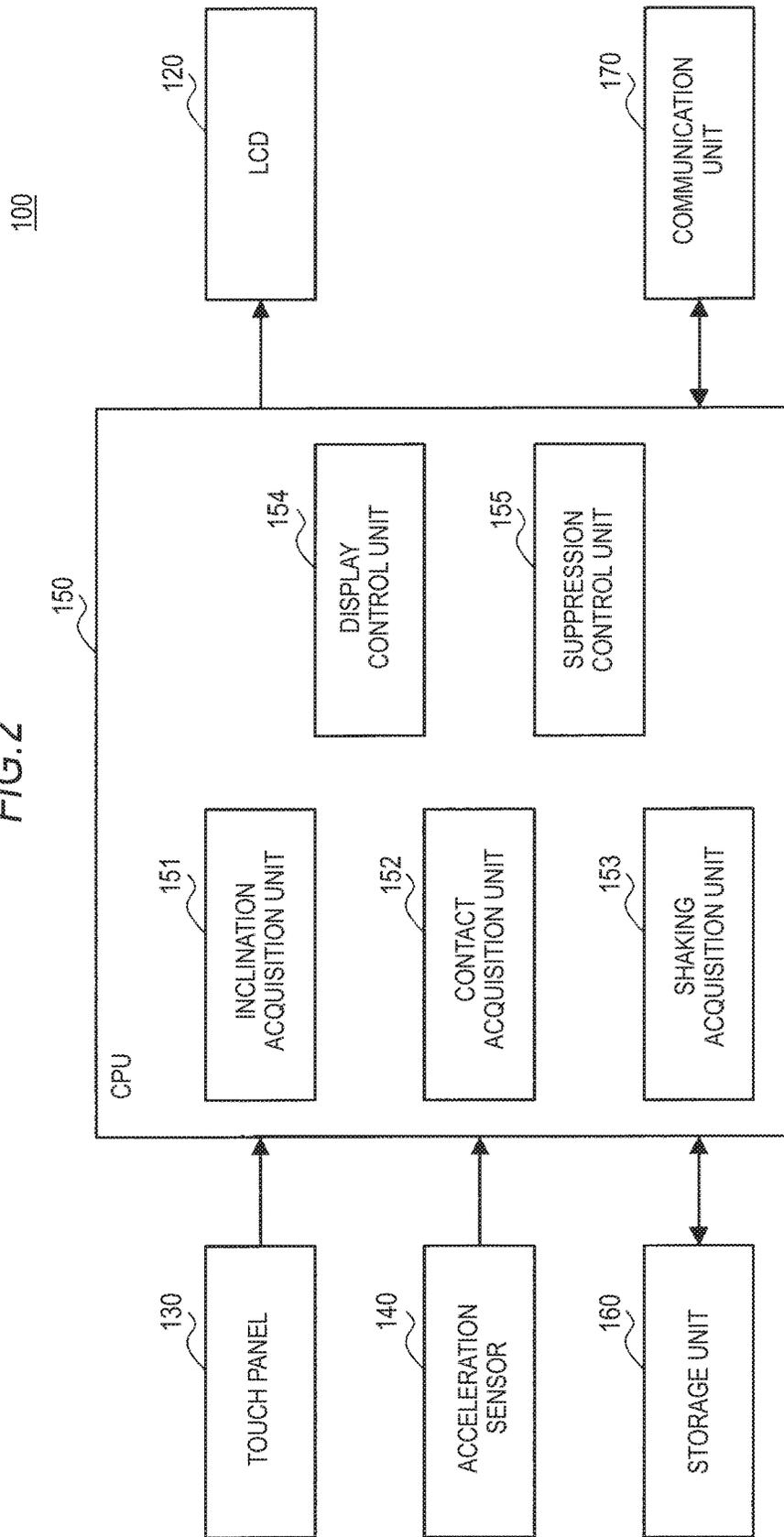


FIG. 3

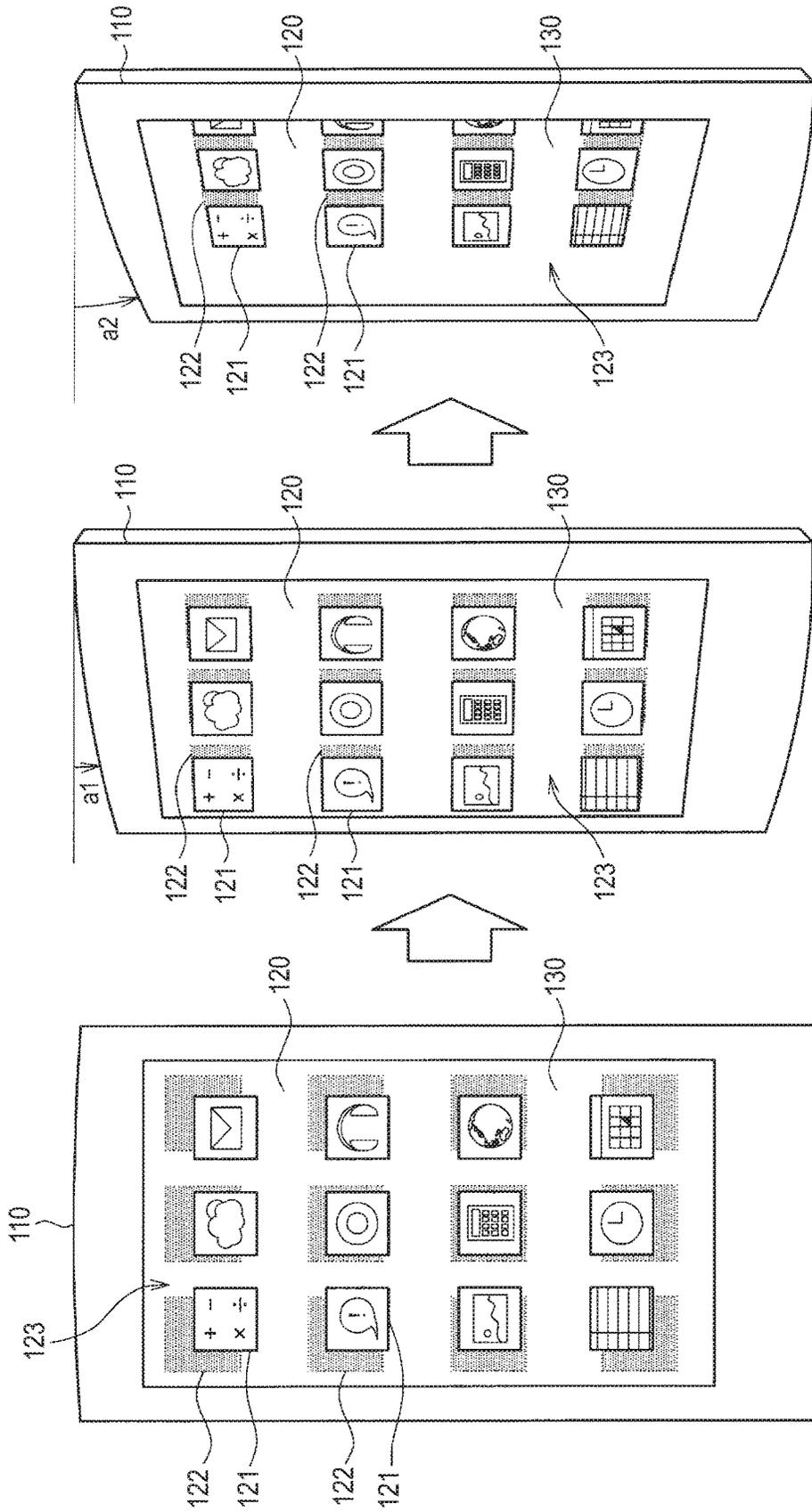


FIG. 4

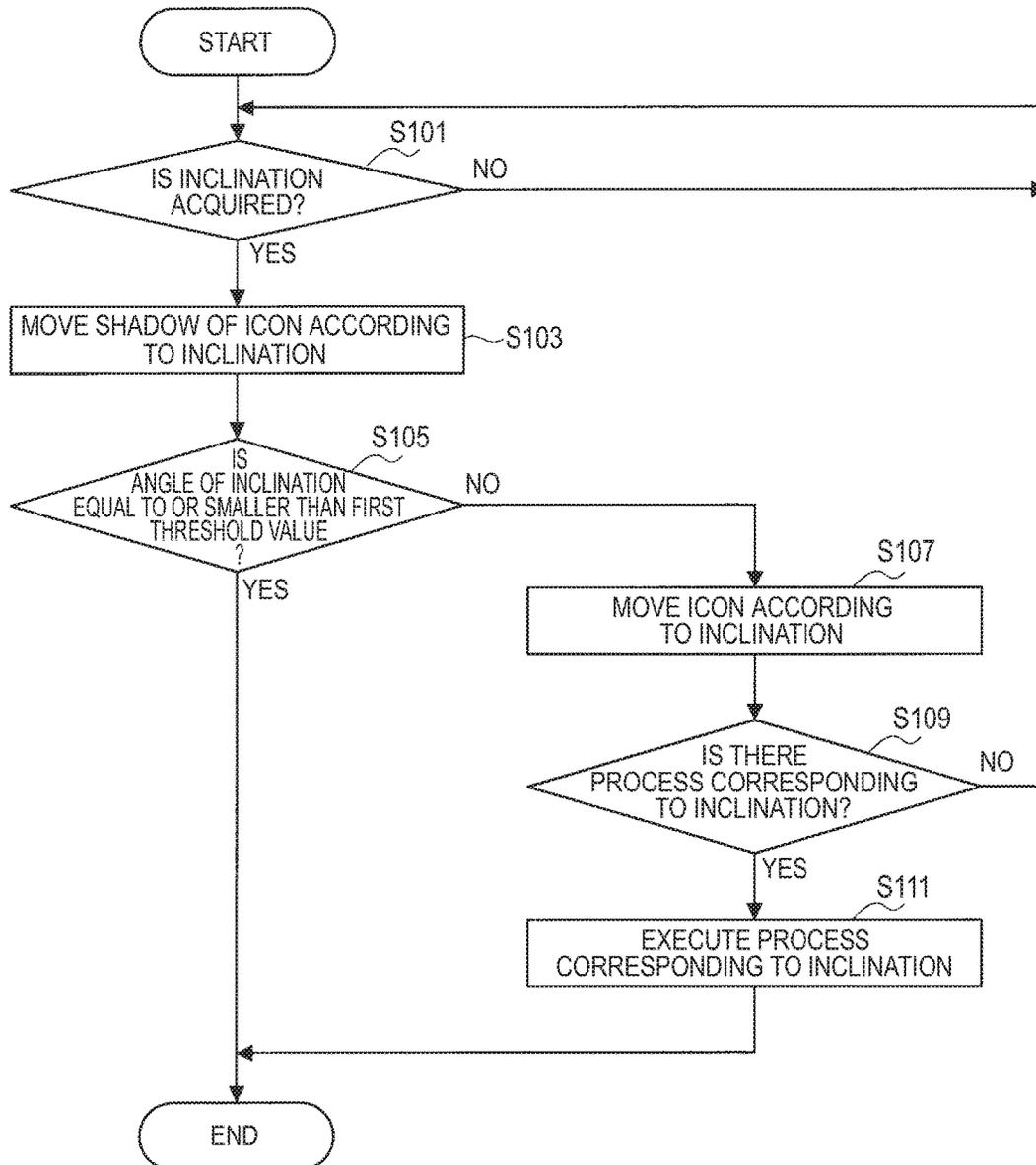


FIG. 5

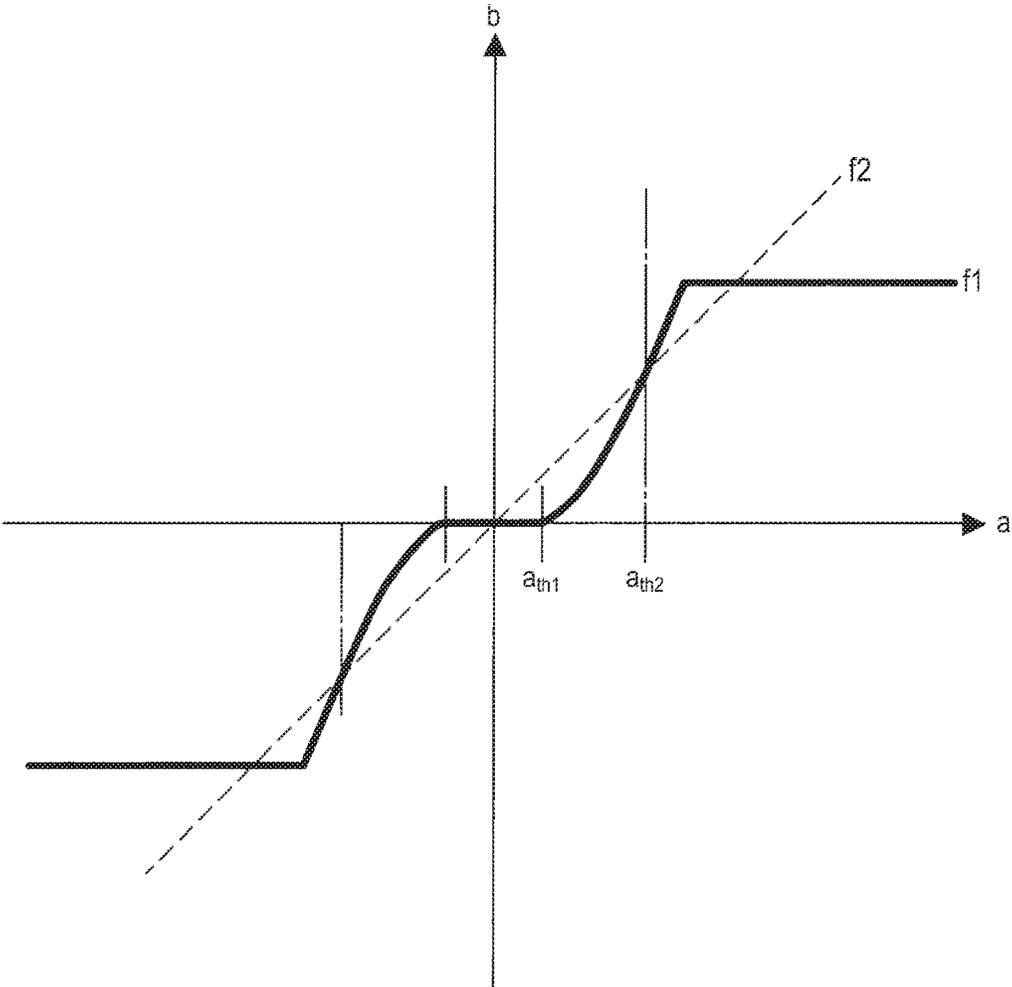


FIG. 6

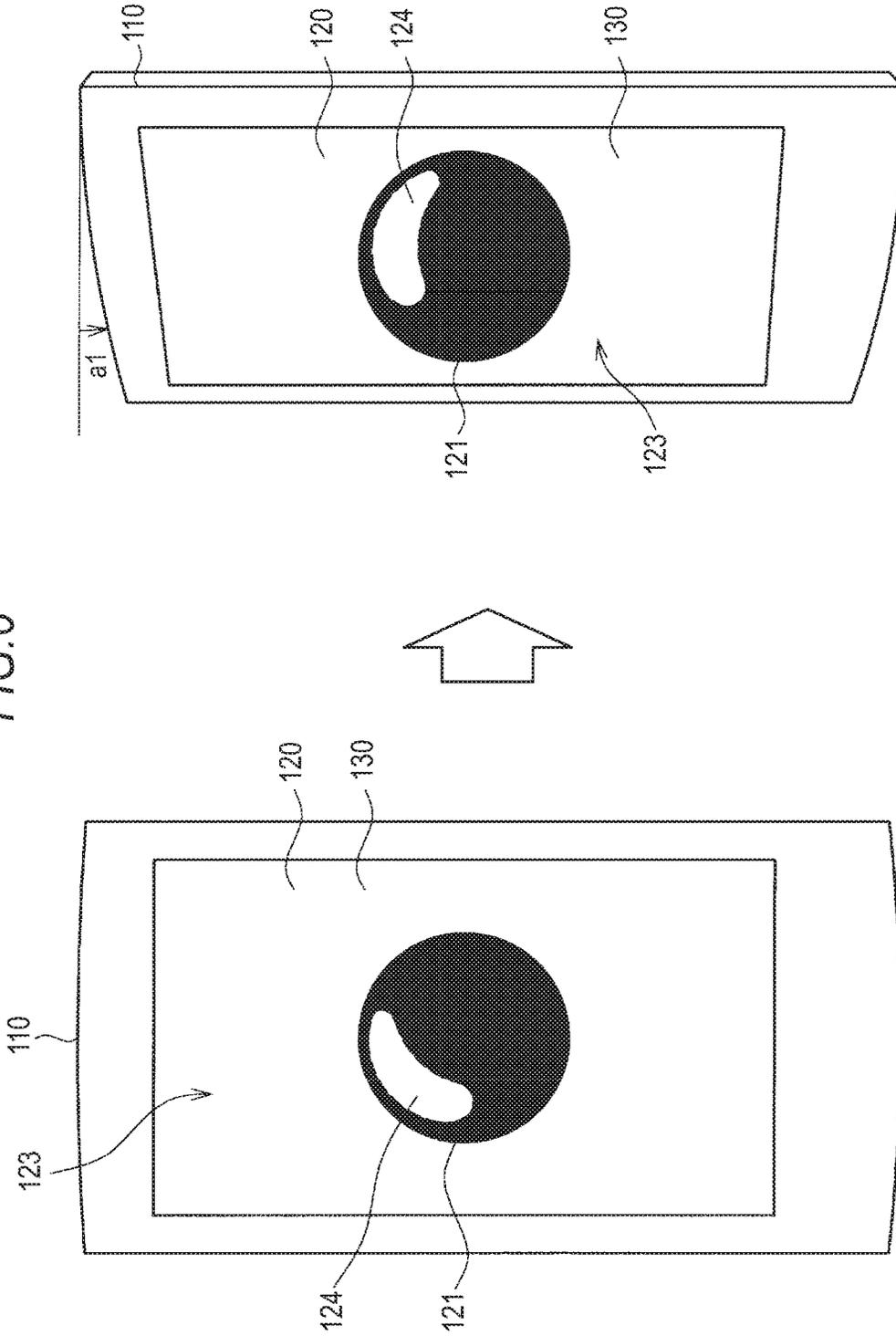




FIG. 8

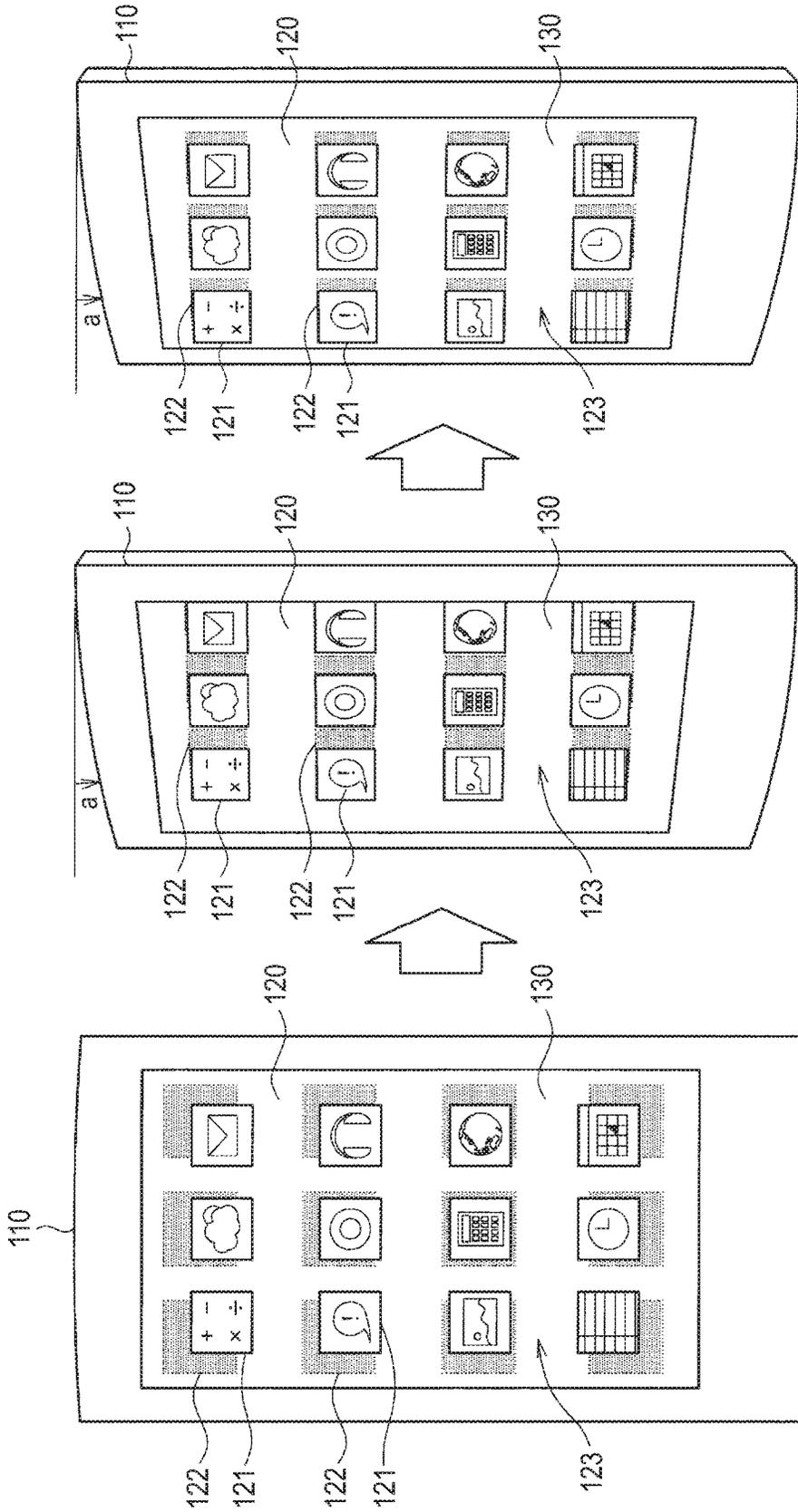


FIG.9

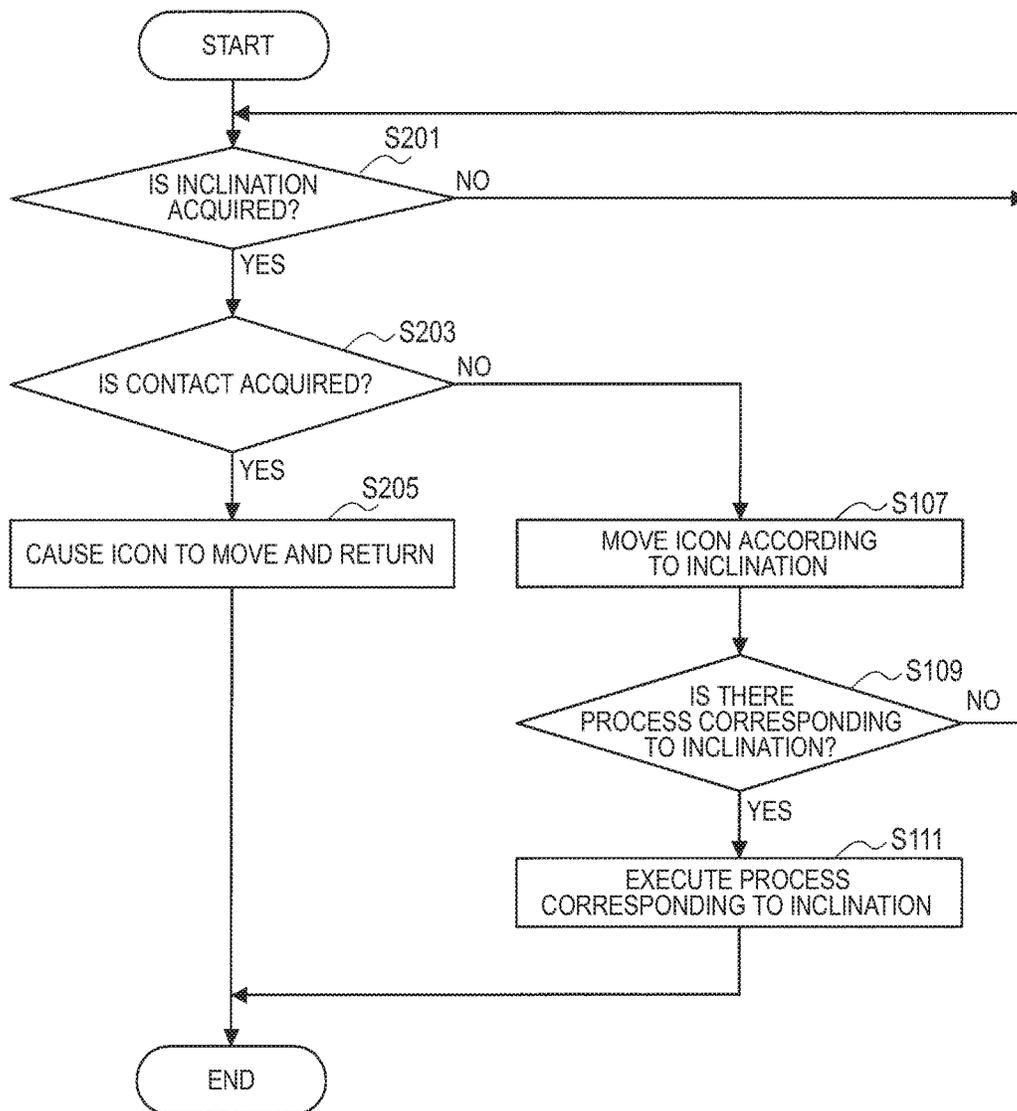


FIG. 10

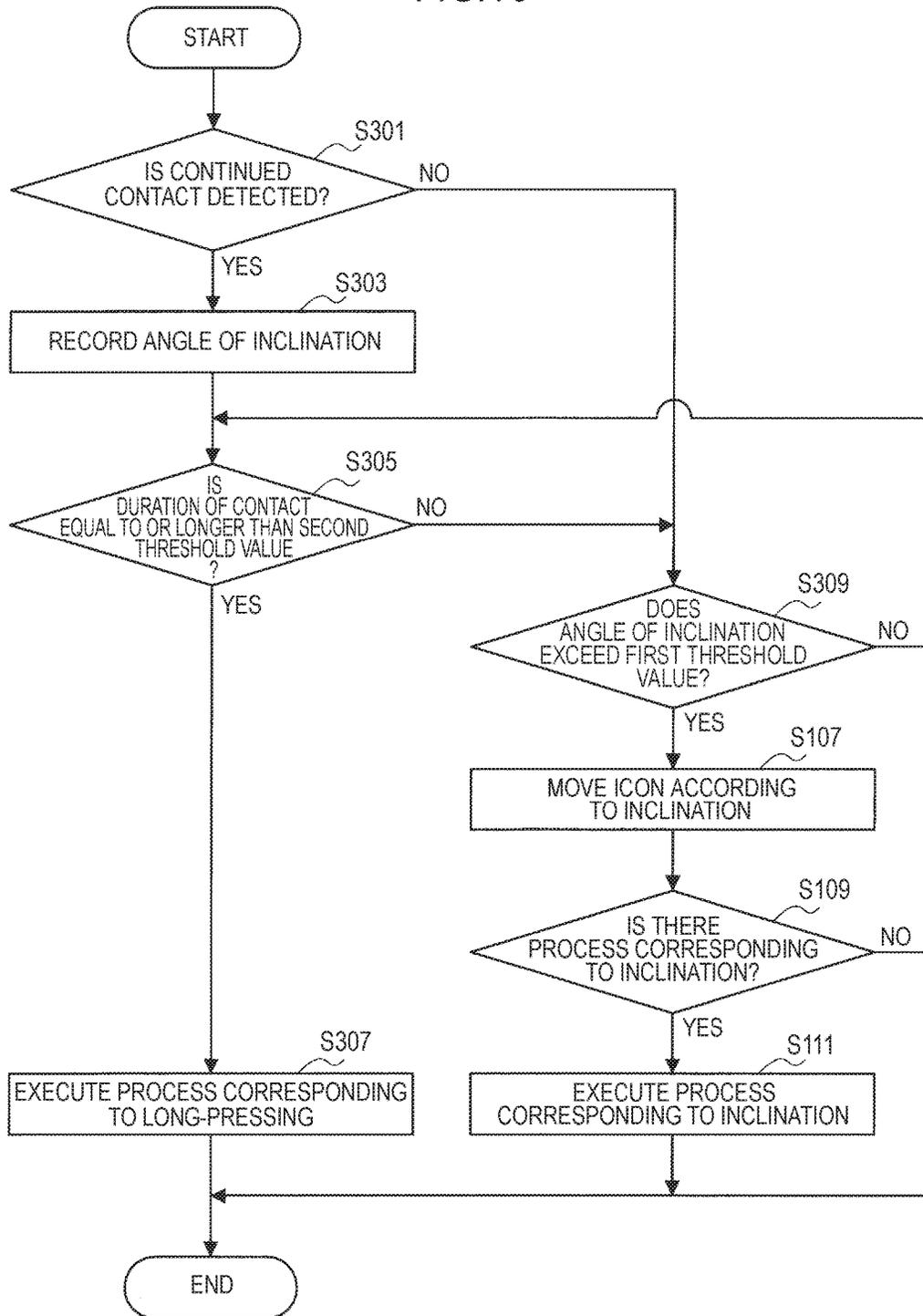
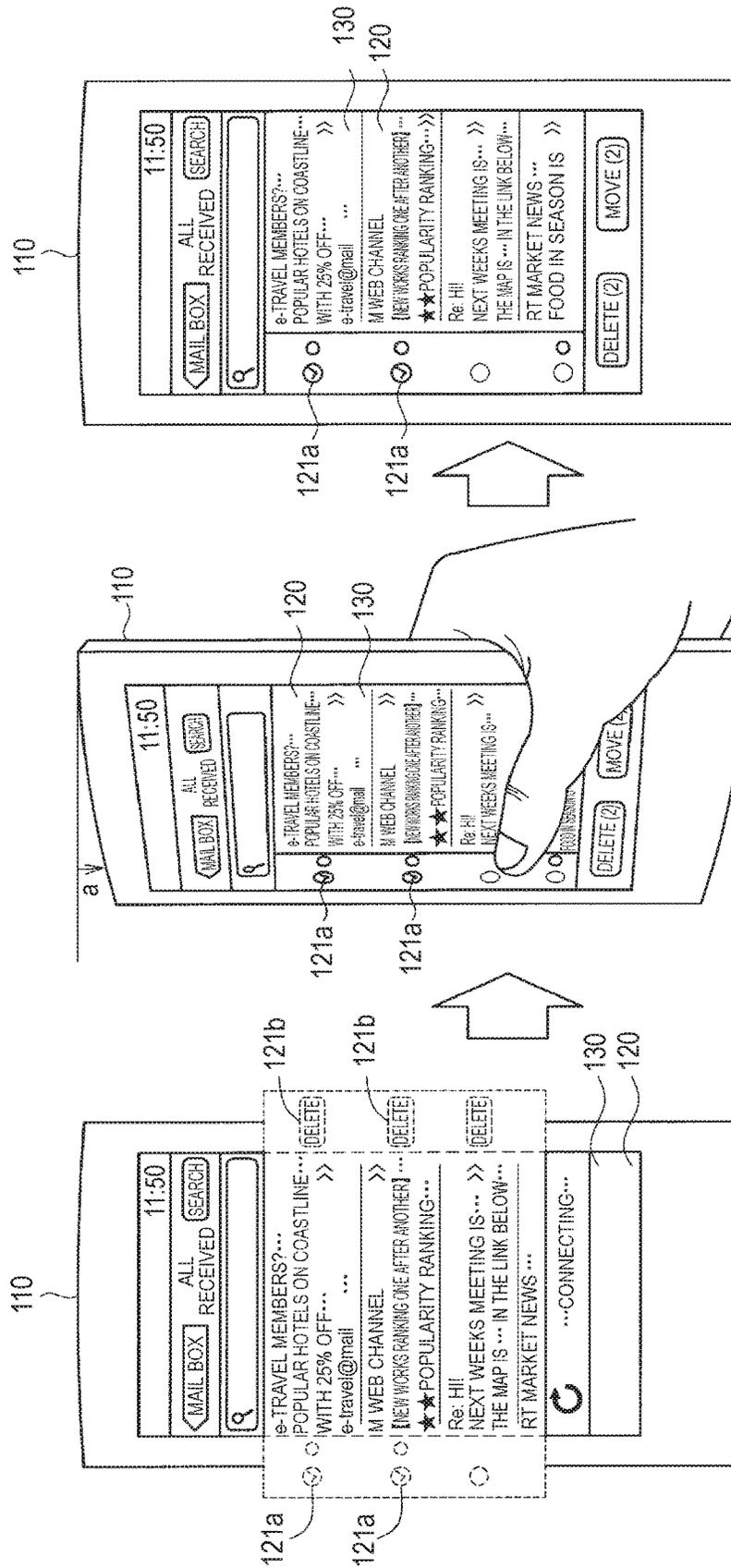


FIG. 11



**INFORMATION PROCESSING DEVICE AND  
INFORMATION PROCESSING METHOD TO  
CONTROL DISPLAY OF IMAGE BASED ON  
INCLINATION INFORMATION**

CROSS-REFERENCE TO RELATED  
APPLICATIONS

The present application is a continuation application of U.S. patent application Ser. No. 13/295,732, filed Nov. 14, 2011, which claims the benefit of priority from prior Japanese Priority Patent Application JP 2010-263408 filed in the Japan Patent Office on Nov. 26, 2010. Each of the above-referenced applications is hereby incorporated herein by reference in its entirety.

FIELD

The present disclosure relates to an information processing device, an information processing method, and a computer program product, and particularly to an information processing device, an information processing method, and a computer program product that brings a display change to a displayed image.

BACKGROUND

In recent years, the arithmetic capability and the communication speed of information processing devices have been rapidly enhanced. However, in a relatively small-sized information processing device such as a portable terminal, for example, since the size of a display unit which displays processing results is limited, there are cases where the quantity of information to be displayed is restricted and high performance as described above is not fully utilized.

Thus, a technique for making effective use of a display unit of an information processing device has been developed. For example, there is a technique in which a touch panel is provided in the display unit to secure operability and expand the display unit. JP-A-2010-109552 and JP-A-2009-009252 disclose a technique in which pushing conditions of a touch panel are used as operation inputs.

In addition, there is a technique in which changes in the state of a housing of an information processing device are used as operation inputs, and various operation inputs are realized without reducing the size of a display unit. JP-A-2004-334642 discloses a technique in which application of shaking to a housing is used as an operation input. JP-A-2005-245619 discloses a technique in which inclination of a housing is used as an operation input.

SUMMARY

However, as recognized by the present inventors there is a problem in that unintended operation inputs by a user occur when there are various operation input methods as described in JP-A-2010-109552, JP-A-2009-009252, JP-A-2004-334642, and JP-A-2005-245619. For example, in an information processing device in which inclination causes a certain operation, there is a case where inclination is acquired as an operation input even with the user's unintended slight inclination of the housing. For this problem, not acquiring slight inclination of a housing as an operation input was considered. In such a case, however, for example, if nothing happens even though the housing of an information processing device is inclined, it is problematic in that information regarding whether inclination of a housing is

not set as an operation input or just the response of a sensor detecting inclination is poor is not delivered to the user.

Thus, it is desirable to provide an information processing device, an information processing method, and a program which are novel and improved and can perform suppression control for operation inputs and provide a user with information on the suppression control.

According to an exemplary information processing apparatus embodiment, the apparatus includes an inclination acquisition device that acquires inclination information of a display housing that houses a display with a displayed image thereon; a first controller that causes a first change to the displayed image according to the inclination information; and a second controller that causes a second change to the displayed image when a predetermined condition is met with respect to the inclination information.

One aspect of this embodiment is that it may further include a processing circuit that includes at least one of the inclination acquisition device, the first controller and the second controller.

According to another aspect the processing circuit responds to a detected shaking of the display housing by performing a zero point adjustment.

According to another aspect the predetermined condition is met when the inclination information exceeds a predetermined threshold.

According to another aspect the embodiment may further include the display, the display being a touchpanel, wherein the predetermined condition is met when an operation on the touchpanel is not detected.

According to another aspect the first change to the displayed image is a movement of at least one of a shadow of a displayed object, a background portion of the displayed object, and reflected light.

According to another aspect when an amount of inclination of the display housing is greater than zero but less than a predetermined amount, the displayed object does not move on the display despite the movement of the at least one of the shadow of the displayed object, the background portion of the displayed object, and the reflected light.

According to another aspect when an amount of inclination of the display housing is greater than a predetermined amount, the displayed object moves on the display along with the movement of the at least one of a shadow of the displayed object, the background portion of the displayed object, and the reflected light.

According to another aspect when the amount of inclination of the display housing is greater than the predetermined amount, other objects that were previously hidden are displayed on the display.

According to another aspect the second change to the displayed image is a movement of a displayed object, the displayed object being user-selectable to trigger a processing operation.

According to an exemplary information processing method embodiment, the method includes acquiring from an inclination acquisition device inclination information of a display housing that houses a display with a displayed image thereon; making a first change to the displayed image according to the inclination information; and making a second change to the displayed image when a predetermined condition is met with respect to the inclination information.

According to one aspect of this embodiment, the making a first change and the making a second change are made with a processing circuit.

According to another aspect the embodiment includes responding to a detected shaking of the display housing by performing a zero point adjustment.

According to another aspect the predetermined condition is met when the inclination information exceeds a predetermined threshold.

According to another aspect the making the first change to the displayed image includes moving on the display at least one of a shadow of a displayed object, a background portion of the displayed object, and reflected light.

According to another aspect when an amount of inclination of the display housing is greater than zero but less than a predetermined amount, not moving the displayed object on the display while moving the at least one of the shadow of the displayed object, the background portion of the displayed object, and the reflected light.

According to another aspect when an amount of inclination of the display housing is greater than a predetermined amount, moving the displayed object on the display along while also moving the at least one of the shadow of the displayed object, the background portion of the displayed object, and the reflected light.

According to another aspect when the amount of inclination of the display housing is greater than the predetermined amount, displaying other objects that were previously hidden on the display.

According to another aspect the second change to the displayed image is a movement of a displayed object, the displayed object being user-selectable to trigger a processing operation.

According to an exemplary non-transitory computer readable storage device embodiment, the device includes instructions stored thereon that when executed by a processing circuit perform an information processing method that includes

acquiring from an inclination acquisition device inclination information of a display housing that houses a display with a displayed image thereon;

making a first change to the displayed image according to the inclination information; and

making a second change to the displayed image when a predetermined condition is met with respect to the inclination information.

According to the embodiments of the present disclosure described above, it is possible to provide an information processing device, an information processing method, and a program which can perform suppression control for operation inputs and provide a user with information on the suppression control.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram showing the appearance of a portable terminal according to a first embodiment of the present disclosure;

FIG. 2 is a block diagram showing a functional configuration of the portable terminal according to the first embodiment of the present disclosure;

FIG. 3 is a diagram showing an example of a display change in the portable terminal according to the first embodiment of the present disclosure;

FIG. 4 is a flowchart showing a process executed in the portable terminal according to the first embodiment of the present disclosure;

FIG. 5 is a diagram showing another example of a display change in the portable terminal according to the first embodiment of the present disclosure;

FIG. 6 is a diagram showing still another example of a display change in the portable terminal according to the first embodiment of the present disclosure;

FIG. 7 is a diagram showing an example of a display change in a portable terminal according to a second embodiment of the present disclosure;

FIG. 8 is a flowchart showing a process executed in the portable terminal according to the second embodiment of the present disclosure;

FIG. 9 is a flowchart showing a process executed in a portable terminal according to a third embodiment of the present disclosure;

FIG. 10 is a diagram showing an example of a display change in a portable terminal according to a fourth embodiment of the present disclosure; and

FIG. 11 is a diagram illustrating an example of suppression of a display change in each embodiment of the present disclosure.

DETAILED DESCRIPTION

Hereinafter, exemplary embodiments of the present disclosure will be described in detail with reference to accompanying drawings. Repetitive description will be omitted by giving the same reference numerals to constituent elements that have substantially the same functional configuration in the present specification and the drawings.

Furthermore, description will be provided in the following order.

1. First Embodiment
2. Second Embodiment
3. Third Embodiment
4. Fourth Embodiment
5. Fifth Embodiment
6. Supplement

1. First Embodiment

First, a first embodiment of the present disclosure will be described.

(Configuration of Portable Terminal)

FIG. 1 is a diagram showing the appearance of a portable terminal 100 according to a first embodiment of the present disclosure. The portable terminal 100 is an example of an information processing device. Referring to FIG. 1, the portable terminal 100 includes a housing 110, and the housing 110 is provided with an LCD (Liquid Crystal Display) 120. The LCD 120 is an example of a display unit and displays images as the output of the portable terminal 100. Furthermore, the display unit is not limited to the LCD 120, and an arbitrary display device such as an organic EL (Electro-Luminescence) panel may be used. The LCD 120 may be provided with a touch panel 130. The touch panel 130 senses a user's contact with the LCD 120. When an operation unit such as a button is separately provided, the touch panel 130 may not necessarily be provided. The portable terminal 100 can have various functions of, for example, voice calling, network communication, music and video reproduction, capturing moving and still images, and the like. The housing 110 may be provided with other devices to realize these functions, for example, a speaker, a microphone, a camera, input and output terminals, an antenna, or the like, in addition to the LCD 120 and the touch panel 130.

Subsequently, an example of an image displayed on the LCD 120 will be described with reference to FIG. 1. The LCD 120 displays an icon 121 accompanied by an icon shadow 122. On the back side of the icon 121 and the icon shadow 122, a background 123 is displayed. The icon 121 is an example of an object included in the displayed image. The icon 121 can be an operational component which is operated by a user through, for example, the touch panel 130. In this case, the user can give an operation instruction for realizing a predetermined function in the portable terminal 100 by contacting the area where the icon 121 of the LCD 120 is displayed through the touch panel 130. In addition, the icon 121 may be an image indicating content that can be used by the portable terminal 100. Furthermore, the object is not limited to the icon 121, and may be, for example, an image of video content. The icon shadow 122 is displayed as a visual effect to emphasize the stereoscopic effect when, for example, the icon 121 is to be three-dimensionally displayed. The background 123 is displayed as the background of the icon 121 and the icon shadow 122. For example, when the icon 121 is an operational component that is operated by a user through the touch panel 130, an operation instruction is not given to the portable terminal 100 even if the user contacts the area where the background 123 of the LCD 120 is displayed through the touch panel 130.

FIG. 2 is a block diagram showing a functional configuration of the portable terminal 100 according to the first embodiment of the present disclosure. Referring to FIG. 2, the portable terminal 100 includes the LCD 120, the touch panel 130, an acceleration sensor 140, a CPU (Central Processing Unit) 150, a storage unit 160, and a communication unit 170. In addition, the CPU 150 realizes functions of an inclination acquisition unit 151, a contact acquisition unit 152, a shaking acquisition unit 153, a display control unit 154, and a suppression control unit 155.

Since each of the functions of the LCD 120 and the touch panel 130 has been described before referring to FIG. 1, detailed description thereof will be omitted, but herein, description will be provided in relation to other function configurations. A display image is provided to the LCD 120 by the CPU 150. The touch panel 130 provides the CPU 150 with the presence of user contact with the LCD 120, and information of a position where the user contact on the LCD 120.

The acceleration sensor 140 is a sensor that senses the acceleration applied to the housing 110 of the portable terminal 100. The information of acceleration that the acceleration sensor 140 senses is provided to the CPU 150. With a change in acceleration, it is possible to detect a change in the state of the housing 110, for example, inclination, shaking, and the like of the housing 110. Furthermore, the acceleration sensor 140 can be an acceleration sensor of any type, for example, a two-axis acceleration sensor, a three-axis acceleration sensor, or the like, according to the change type of the state of the housing 110 necessary for a process in the CPU 150. In addition, other sensors that can detect a change in the state of the housing 110 as described above may be used instead of the acceleration sensor 140.

The CPU 150 controls the operation of each part of the portable terminal 100. The CPU 150 is a processor that executes programs stored in the storage unit 160, and realizes functions of the inclination acquisition unit 151, the contact acquisition unit 152, the shaking acquisition unit 153, the display control unit 154, and the suppression control unit 155 by executing the programs. In addition to these functions, the CPU 150 realizes various functions that

the portable terminal 100 can have, for example, voice calling, network communication, music and video reproduction, capturing moving and still images, and the like. In order to realize these functions, the CPU 150 acquires information from the touch panel 130 and the acceleration sensor 140, provides images to the LCD 120, and exchanges data with the storage unit 160 and the communication unit 170. In addition, the CPU 150 may acquire or provide information from or with other devices that the portable terminal 100 has, in order to realize the functions.

Hereinbelow, functions of the inclination acquisition unit 151, the contact acquisition unit 152, the shaking acquisition unit 153, the display control unit 154, and the suppression control unit 155 realized by the CPU 150 will be described. The functions can be realized by the CPU 150 executing the programs stored in the storage 160 as described above, but it is not limited thereto, and all or some of the functions may be realized by a dedicated circuit configuration provided separately from, for example, the CPU 150.

The inclination acquisition unit 151 acquires inclination of the housing 110 based on information of acceleration of the housing 110 of the portable terminal 100 provided from the acceleration sensor 140. Specifically, the inclination acquisition unit 151 may calculate the direction and angle of the inclination of the housing 110 based on the direction and magnitude of the acceleration of the housing 110. The inclination acquisition unit 151 may provide the calculated direction and angle of the inclination of the housing 110 to the display control unit 154 and the suppression control unit 155.

The contact acquisition unit 152 acquires information of the presence of user contact with the LCD 120 and the position where the user contacts the LCD 120, which is provided from the touch panel 130. For example, the contact acquisition unit 152 may acquire the contact with an area where the icon 121 on the LCD 120 is displayed as a pressing operation to the icon 121. In addition, the contact acquisition unit 152 may acquire the contact as a long-pressing operation to the icon 121 when the contact with the area where the icon 121 on the LCD 120 is displayed is continued over a predetermined time period. Furthermore, the contact acquisition unit 152 may acquire the contact as an operation of a movement (also referred to as a flicking operation) when the contact position is moved in the state where the contact is continued on the LCD 121. The contact acquisition unit 152 acquires a pressing operation, a long-pressing operation, or a movement operation for the icon 121, and may provide the operation to the display control unit 154 and the suppression control unit 155.

The shaking acquisition unit 153 acquires the shaking of the housing 110 based on the information of the acceleration of the housing 110 of the portable terminal 100 provided from the acceleration sensor 140. Specifically, the shaking acquisition unit 153 may acquire that there was the shaking of the housing 110 based on a change in the acceleration of the housing 110 within a predetermined time. The shaking acquisition unit 153 acquires that there was the shaking of the housing 110, and may provide the information to the display control unit 154 and the suppression control unit 155. Optionally, when the shaking acquisition unit 153 detects shaking of the housing, a zero point adjustment is made to the inclination angle of the housing (e.g., reset or recalibrate the angle at which the housing is deemed to not be inclined).

The display control unit 154 provides the image to the LCD 120. In addition, the display control unit 154 makes a display change in the icon 121, the icon shadow 122, or the

background 123 included in the display image. Herein, the display control unit 154 may make the display change in a part or all of the inclination of the housing 110 acquired by the inclination acquisition unit 151, various contact operations acquired by the contact acquisition unit 152, and the shaking of the housing 110 acquired by the shaking acquisition unit 153. The display change includes at least a first display change and a second display change according to the inclination of the housing 100 acquired by the inclination acquisition unit 151. Furthermore, there is a case where the display control unit 154 suppresses the first display change with the action of the suppression control unit 155. Specifically what kind of display change the first and the second display changes are and what kind of a case the first and the second display changes are made will be described later.

The suppression control unit 155 suppresses the first display change that the display control unit 154 makes to the icon 121, the icon shadow 122, or the background 123 displayed on the LCD 120. The suppression control unit 155 may suppress the first display change based on a part or all of the inclination of the housing 110 acquired by the inclination acquisition unit 151, various contact operations acquired by the contact acquisition unit 152, and the shaking of the housing 110 acquired by the shaking acquisition unit 153. Specifically what kind of a case the suppression control unit 155 restricts the first display change will be described later.

The storage unit 160 temporarily or permanently stores various data relating to the process of the portable terminal 100. The storage unit 160 may be, for example, a semiconductor memory such as a flash ROM (Read Only Memory) or a DRAM, an optical disc such as a BD (Blu-ray Disc), a DVD (Digital Versatile Disc), or a CD (Compact Disc), a hard disk, or the like. The storage unit 160 may be a storage device built in the portable terminal 100 or a removable medium such as a memory card that can be loaded or unloaded on the portable terminal 100. In addition, the storage unit 160 may include a plurality of types of storage devices or a removable medium. The storage unit 160 can store programs executed by the CPU 150 in order to realize functions of the inclination acquisition unit 151, the contact acquisition unit 152, the shaking acquisition unit 153, the display control unit 154, and the suppression control unit 155, and other various functions. The programs may be stored in the storage unit 160 in advance, and may be programs provided by being stored in the removable medium or programs downloaded from a network through the communication unit 170 which are temporarily stored in the storage unit 160. Furthermore, the storage unit 160 can temporarily store information exchanged by the CPU 150 with the LCD 120, the touch panel 130, the acceleration sensor 140 and the communication unit 170, and information generated by the CPU 150 in the course of a process.

The communication unit 170 is a communication interface including a communication device for connecting to a network. The communication unit 170 can be a port or a communication card for, for example, a USB (Universal Serial Bus), an IEEE 1394, an SCSI (Small Computer System Interface), an HDMI (High-Definition Multimedia Interface), a LAN (Local Area Network), a Bluetooth (registered trademark), a WUSB (Wireless USB), or the like. The communication unit 170 is connected to a network such as the Internet, a household LAN, infrared communication, radio wave communication, satellite communication or the like, and exchanges various data regarding the process of the portable terminal 100. The communication unit 170 may download a program executed by the CPU 150 for realizing

the functions of the inclination acquisition unit 151, the contact acquisition unit 152, the shaking acquisition unit 153, the display control unit 154, and the suppression control unit 155, and other various functions from a network and store the program in the storage unit 160. (Operation of Portable Terminal)

FIG. 3 is a diagram showing an operation example of the portable terminal 100 according to the first embodiment of the present disclosure. FIG. 3 shows changes in display positions of the icon 121 and the icon shadow 122 when the housing 110 of the portable terminal 100 is not inclined, and when the angle of inclination is an angle  $a_1$ , and when the angle of further inclination is an angle  $a_2$  in the case where the housing is inclined. Furthermore, the angle  $a_2$  is an angle greater than the angle  $a_1$ .

When the housing 110 is not inclined, each icon 121 is arrayed at a position with substantially the same intervals in the upper, lower, right and left sides as shown in the drawing. The display position of the icon shadow 122 is a position displaced in the direction toward the periphery from the center of the display unit 120 for each icon 121.

When the housing 110 is inclined and the angle of the inclination is the angle  $a_1$ , the display position of the icon 121 does not move while being left at the display position in the state where the housing 110 is not inclined. On the other hand, the display position of the icon shadow 122 moves to the right side of the display unit 120, and is at a position displaced in the right side of each icon 121. The movement of the display position of the icon shadow 122 may be a movement according to the inclination of the housing 110. Furthermore, the display position of the icon 121 may move slightly to the right side of the display unit 120, not staying still, as described below.

When the housing 110 is further inclined to form the angle  $a_2$  as the angle of the inclination, the display position of the icon 121 moves to the right side of the display unit 120. On the other hand, the display position of the icon shadow 122 further moves to the right side of the display unit 120 from the state where the housing 110 is inclined by the angle  $a_1$ . The movement of both display positions of the icon 121 and the icon shadow 122 as above can be movements corresponding to the movement of the housing 110.

At this time, a process responding to the inclination of the housing 110 may be further executed. The process may be a process in which a new icon 121 appears on the display unit 120, the icon 121 that has already been displayed is erased from the display unit 120, or the size of the displayed icon 121 changes. In addition, the process may not necessarily relate to a display change, and can be various kinds of processes that the portable terminal 100 can execute.

With the operation of the portable terminal 100 as described above, the movements of the icon 121 and the icon shadow 122 displayed on the display unit 120 when the housing 110 is gradually inclined can be observed by the user in such a way that, for example, the icon shadow 122 starts to move to the right side of the display unit 120 first, and the icon 121 starts to move to the right side later.

Furthermore, the arrangement of the icon 121 and the icon shadow 122 in the example shown in the drawing is just an example. The display position of the icon shadow 122 when the housing 110 is not inclined is not limited to the above example, and may be, for example, a position displaced to a different direction from the icon 121. In addition, as the display position of the icon shadow 122 when the housing 110 which is not inclined overlaps the icon 121, the icon shadow 122 after the housing 110 starts inclining may be displayed to be observed by the user.

In addition, in the above example, both display positions of the icon **121** and the icon shadow **122** move to the right side of the display unit **120** so as to rebound on the inclination of the housing **110**, but the direction in which the display positions of the icon **121** and the icon shadow **122** move is not limited to the example. The display positions of the icon **121** and the icon shadow **122** may move, for example, to the left side of the display unit **120** as if the positions slide down by the inclination of the housing **110**. Furthermore, it is needless to say that the direction of the display positions of the icon **121** and the icon shadow **122** is determined according to the direction in which the housing **110** is inclined.

In the portable terminal **100** that is operated as above, when the angle of inclination of the housing **110** is in the range including the angle  $a1$ , the “movement of the display position of the icon **121**” that is the first display change that the display control unit **154** gives to the display image in the embodiment is suppressed by the suppression control unit **155**. In addition, while the movement of the display position of the icon **121** is suppressed as such, “movement of the display position of the icon shadow **122**” that is the second display change in the embodiment is executed by the display control unit **154**.

(Process in Portable Terminal)

FIG. 4 is a flowchart showing a process in the portable terminal **100** according to the first embodiment of the present disclosure. FIG. 4 shows a process of the portable terminal **100** according to the embodiment for executing a display change and a process according to the inclination of the housing **110** acquired by the inclination acquisition unit **151**.

First, in Step **S101**, the display control unit **154** determines whether or not the inclination of the housing **110** is acquired by the inclination acquisition unit **151**. When the inclination of the housing **110** is acquired here, the process advances to Step **S103**. On the other hand, when the inclination of the housing **110** is not acquired, the process returns to the start.

In Step **S103**, the display control unit **154** causes the display position of the icon shadow **122** displayed on the display unit **120** to move according to the inclination of the housing **110** acquired by the inclination acquisition unit **151**. Furthermore, as described above, the movement of the display position of the icon shadow **122** is the second display change that the display control unit **154** brings about to the display image.

Successively in Step **S105**, the suppression control unit **155** determines whether or not the angle of the inclination of the housing **110** acquired by the inclination acquisition unit **151** is equal to or smaller than a first threshold value. When the angle of the inclination of the housing **110** is equal to or smaller than the first threshold value here, the suppression control unit **155** ends the series of process. On the other hand, when the angle of the inclination of the housing **110** exceeds the first threshold value, the process advances to Step **S107**. Furthermore, the first threshold value is a predetermined threshold value set for the inclination of the housing **110**. In the example shown in FIG. 3, for example, the first threshold value is a value greater than the angle  $a1$  and equal to or smaller than the angle  $a2$ .

In Step **S107**, the display control unit **154** causes the display position of the icon **121** displayed on the display unit **120** to move according to the inclination of the housing **110** acquired by the inclination acquisition unit **151**. Furthermore, as described above, the movement of the display

position of the icon **121** is the first display change that the display control unit **154** brings about to the display image.

Successively in Step **S109**, the CPU **150** determines whether or not a process corresponding to the inclination of the housing **110** acquired by the inclination acquisition unit **151** is set. When a process corresponding to the inclination is set here, the process advances to Step **S111**. On the other hand, when a process corresponding to the inclination is not set, the process returns to the start.

In Step **S111**, the CPU **150** executes the process corresponding to the inclination of the housing **110** acquired by the inclination acquisition unit **151**. The process is not necessarily limited to the process of display changes by the display control unit **154**, and may be another type of process that the portable terminal **100** can execute. A process that the display control unit **154** can execute here can be a process in which, for example, a new icon **121** appears on the display unit **120**, an icon **121** that has already been displayed is erased from the display unit **120**, the size of a displayed icon **121** changes, or the like. In addition, as another process that the portable terminal **100** can execute, there may be a process relating to, for example, voice calling, network communications, music and video reproduction, capturing moving or still images, or the like.

In the above-described process of the portable terminal **100**, when the angle of the inclination of the housing **110** acquired by the inclination acquisition unit **151** is equal to or smaller than the first threshold value, the process ends by the suppression control unit **155**. Accordingly, the “movement of the display position of the icon **121**” that is the first display change that the display control unit **154** brings about to the display screen is not executed in that case. In other words, when the angle of the inclination of the housing **110** is equal to or smaller than the first threshold value, the “movement of the display position of the icon **121**” that is the first display change is suppressed.

On the other hand, in the above-described process of the portable terminal **100**, even when the angle of the inclination of the housing **110** acquired by the inclination acquisition unit **151** is equal to or smaller than the first threshold value, the “movement of the display position of the icon shadow **122**” that is the second display change that the display control unit **154** brings about to the display screen is executed. In other words, while the “movement of the display position of the icon **121**” that is the first display change is suppressed, the “movement of the display position of the icon shadow **122**” that is the second display change is executed.

(Regarding Suppression of Display Change)

FIG. 5 is a diagram illustrating the definition of “suppression of the first display change” in the embodiment of the present disclosure. Referring to FIG. 5, the horizontal axis represents the inclination angle  $a$  of the housing **110**, the vertical axis represents the quantity of a display change  $b$ , and an example of a function  $f1$  showing the relationship between the inclination angle  $a$  and the quantity of a display change  $b$  in the first display change and of a function  $f2$  showing the relationship between the inclination angle  $a$  and the quantity of a display change  $b$  in the second display change is shown. In the inclination angle  $a$  of the housing, two threshold values of  $ath1$  and  $ath2$  each corresponding to two definitions of “suppression of the first display change” are shown.

In the example shown in the drawing, when the inclination angle  $a$  is equal to or smaller than the threshold value  $ath1$ , the value of the quantity of a display change  $b$  of the function  $f1$  is substantially 0. In a first definition, a state

## 11

where the value of the quantity of a display change  $b$  of the function  $f1$  is substantially 0 is defined as "a state where the first display change is suppressed". In this case, the "threshold value" is the threshold value  $ath1$ . As a first example of the display control in the first definition, the suppression control unit 155 of the portable terminal 100 may suppress the first display change by nullifying the inclination of the housing 110 acquired by the inclination acquisition unit 151 when the inclination angle  $a$  is equal to or smaller than the threshold value  $ath1$ . In addition, as a second example, the first display change may be suppressed in a way that the display control unit 154 calculates the quantity of a display change  $b$  with an arithmetic operation of  $b=c \tan a$  for the first display change from the inclination angle  $a$  of the housing 110 acquired by the inclination acquisition unit 151 and the suppression control unit 155 sets a value of coefficient  $c$  so that the quantity of a display change  $b$  becomes substantially 0 when the inclination angle  $a$  is equal to or smaller than the threshold value  $ath1$ .

On the other hand, in the example shown in the drawing, when the inclination angle  $a$  is equal to or smaller than threshold value  $ath2$ , a value of the quantity of a display change  $b$  of the function  $f1$  is lower than a value of the quantity of a display change  $b$  of the function  $f2$ . In the second definition, the state where a value of the quantity of a display change  $b$  of the function  $f1$  is lower than a value of the quantity of a display change  $b$  of the function  $f2$  is defined as a "state where the first display change is suppressed". In this case, the above-described "threshold value" is the threshold value  $ath2$ . As an example of display control in the second definition, the first display change may be suppressed in a way that the display control unit 154 calculates the quantity of a display change  $b$  with arithmetic operations of  $b=c \tan a$  for the first display change and  $b=da$  for the second display change from the inclination angle  $a$  of the housing 110 acquired by the inclination acquisition unit 151 and the suppression control unit 155 sets values of coefficients  $c$  and  $d$  so that a value of the quantity of a display change  $b$  of the function  $f1$  is lower than a value of the quantity of a display change  $b$  of the function  $f2$  when the inclination angle  $a$  is equal to or smaller than the threshold value  $ath2$ .

Herein, the operation of the portable terminal 100 described with reference to FIGS. 3 and 4 above is based on the first definition. As described above, however, the "suppression of the first display change" of the present specification includes at least two definitions of the first and the second ones. For that reason, the operation of the portable terminal 100 as shown in FIG. 3 may be realized based on the second definition. In this case, the portable terminal 100 is in the state where the housing 110 is inclined by the angle  $a1$ , and the display position of the icon 121 may move to the slightly right side of the display unit 120 instead of not moving while being in the display position in the case where the housing 110 is not inclined.

Furthermore, as shown in FIG. 4, the display control unit 154 may apply another control to the quantity of a display change  $b$  of the first display change by setting the quantity of a display change  $b$  to a constant value when the inclination angle  $a$  exceeds a predetermined value. When the inclination angle  $a$  exceeds the threshold value  $ath1$  or the threshold value  $ath2$  and continues to increase, the display control unit 154 may control such that a value of the quantity of a display change  $b$  of the function  $f1$  exceeds a value of the quantity of a display change  $b$  of the function  $f2$  first and then a value of the quantity of a display change  $b$  of the function  $f2$  exceeds a value of the quantity of a display

## 12

change  $b$  of the function  $f1$ . In addition, in the same case, a value of the quantity of a display change  $b$  of the function  $f1$  and a value of the quantity of a display change  $b$  of the function  $f2$  may be controlled to be substantially the same value.

## Modified Example 1

FIG. 6 is a diagram illustrating a modified example of the portable terminal 100 according to a modified example of the first embodiment of the present disclosure. FIG. 6 shows a change in the display position of a glossy portion 124 when the state of portable terminal 100 changes from the state where the housing 110 is not inclined to the state where the housing 110 is inclined by the angle  $a1$ . Furthermore, as described above, the angle  $a1$  is an angle smaller than the first threshold value at which the movement of the display position of the icon 121 is suppressed for the inclination of the housing 110.

In the modified example, the icon 121 is displayed as an object in a flat spherical shape of which the surface bulges. The glossy portion 124 of the icon is displayed as an area on the surface of the icon 121 on which light is reflected to change the color in order to, for example, express a stereoscopic effect of the icon 121.

When the housing 110 is inclined and the angle of the inclination is the angle  $a1$ , the display position of the icon 121 does not move while being in the display position in the state where the housing 110 is not inclined. On the other hand, the display position of the glossy portion 124 of the icon moves on the surface of the icon 121 clockwise from the display position in the state where the housing 110 is not inclined and is in a position where the display position of the glossy portion 124 moves to the slightly right side of the display unit 120. In the modified example, the second display change by the display control unit 154 is the movement of the display position of the glossy portion 124 of the icon. The movement of the display position of the glossy portion 124 of the icon may be a movement according to the inclination of the housing 110. Furthermore, as described above, the display position of the icon 121 does not stay still, but may move to the slightly right side of the display unit 120.

Although not shown in the drawing, when the housing 110 is further inclined and the angle of the inclination is the angle  $a2$ , the movement of the display position of the icon 121 and the further movement of the glossy portion 124 of an icon are the same as in the operation example of the present embodiment described with reference to FIG. 3.

## Modified Example 2

FIG. 7 is a diagram illustrating another modified example of the portable terminal 100 according to the modified example of the first embodiment of the present disclosure. FIG. 7 shows a change in the display of the background 123 when the state of the portable terminal 100 changes from the state where the housing 110 is not inclined and to the state where the housing 110 is inclined by the angle  $a1$ . Furthermore, as described above, the angle  $a1$  is an angle smaller than the first threshold value at which the movement of the display position of the icon 121 is suppressed for the inclination of the housing 110.

In the modified example, the background 123 has a pattern of a radial shape and a concentric shape as shown in the drawing. The pattern can be stereoscopically drawn as an inner face of a virtual hemisphere face. Furthermore, the

13

pattern is an example for making a change in the display of the background **123** in the modified example easily understood. The pattern of the background **123** may be any pattern with which a change in the display as in the modified example can be recognized.

When the housing **110** is inclined and the angle of the inclination is the angle  $a_1$ , the display position of the icon **121** does not move while being in the display position in the state where the housing **110** is not inclined. On the other hand, the background **123** changes so that the virtual hemisphere face rotates from the display of the state where the housing **110** is not inclined, and the displayed pattern turns into a different pattern. In the modified example, the second display change by the display control unit **154** is a change in the display of the background **123**. The change of the display of the background **123** may be movement according to the inclination of the housing **110**. Furthermore, as described above, the display position of the icon **121** does not stand still, but may move to the slightly right side of the display unit **120**.

Although not shown in the drawing, when the housing is further inclined and the angle of the inclination is the angle  $a_2$ , a movement of the display position of the icon **121** and a further change in the display of the background **123** are the same as in the operation example of the embodiment described with reference to FIG. **3**.

(Summary of First Embodiment)

In the first embodiment of the present disclosure described above, there is provided the portable terminal **100** including the inclination acquisition unit **151** which acquires inclination of the housing **110** provided with the LCD **120** on which an image is displayed, the display control unit **154** which gives the first and the second display changes to the displayed image according to the acquired inclination of the housing **110**, and the suppression control unit **155** which suppresses the first display change.

As described above, in the embodiment, the first display change is the movement of the display position of the icon **121** that is an object included in the images displayed on the LCD **120**. The second display change is the movement of the display position of the icon shadow **122**. As described as the modified examples, the second display change may be the movement of the display position of the glossy portion **124** of the icon and a change in the background **123** of the image displayed on the LCD **120**. Furthermore, the second display change may be a change in display in which the above changes are combined.

According to the configuration, when it is desired that the display position of the icon **121** does not move even though the housing **110** of the portable terminal **100** is inclined, for example, when the angle of the inclination of the housing **110** is equal to or smaller than a predetermined threshold value, the movement of the display position of icon **121** by the inclination of the housing **110** is suppressed. For this reason, it is possible to prevent a change in the display position of the icon **121** that the user does not want. On the other hand, while the movement of the display position of the icon **121** is suppressed, the display position of the icon shadow **122** moves. With the movement of the display position of the icon shadow **122** that is the second display change, the user can be made aware that the display position of the icon **121** can be moved by the inclination of the housing **110**. In other words, when there is no movement of the icon **121** even though the housing **110** is inclined, the user can be made aware that this is not because the portable terminal **100** is not responding to the inclination of the housing **110**, but the movement of the icon **121** is suppressed

14

due to a predetermined condition, for example, a condition that the angle of the inclination of the housing **110** is equal to or smaller than a predetermined threshold value.

In the embodiment, when the inclination of the housing **110** acquired by the inclination acquisition unit **151** is equal to or smaller than the first threshold value, the movement of the display position of the icon **121** may be suppressed. With the configuration, it is possible to hinder the movement of the icon **121** by a trivial change in the user's posture when the user holds the portable terminal **100**, in opposition to the user's intention.

In addition, in the embodiment, the movement of the display position of the icon shadow **122** that is the second display change may be a display change according to the inclination of the housing **110** acquired by the inclination acquisition unit **151**. With the configuration, it is possible to give an intuitive hint to the user that the display position of the icon **121** can be moved by the inclination of the housing **110**.

## 2. Second Embodiment

Subsequently, a second embodiment of the present disclosure will be described. Furthermore, since the configuration of the portable terminal **100** is substantially the same in the second and the first embodiment, detailed description thereof will be omitted.

(Operation of Portable Terminal)

FIG. **8** is a diagram showing an operation example of the portable terminal **100** according to the second embodiment of the present disclosure. FIG. **8** shows changes of the display position of the icon **121** when the housing **110** of the portable terminal **100** is not inclined, when the angle of the inclination is an angle  $a$  when the housing **110** is inclined, and when a predetermined time passes after the angle of the inclination is the angle  $a$ .

When the housing **110** is not inclined, each icon **121** is arrayed at a position with substantially the same intervals in the upper, lower, right and left sides as shown in the drawing. The display position of the icon shadow **122** is a position displaced in the direction toward the periphery from the center of the display unit **120** for each icon **121**.

When the housing **110** is inclined and the angle of the inclination is the angle  $a$ , the display position of the icon **121** first moves to the right side of the display unit **120** from the display position of the state where the housing **110** is not inclined. Furthermore, in this case, the icon shadow **122** may move to the right side of the display unit **120** to be displayed at a position displaced to the right side of each icon **121**.

When a predetermined time passes after the angle of the inclination of the housing **110** is the angle  $a$ , the display position of the icon **121** returns to the display position of the state where the housing **110** is not inclined again from the position in which the display position of the icon **121** moved at the first. Furthermore, in this case, the icon shadow **122** may be continuously displayed at a position displaced to the right side of each icon **121**.

The movement of the icon **121** displayed on the display unit **120** when a predetermined time passes in the state where the housing **110** is inclined by the operation of the portable terminal **100** as above is observed by the user as a movement that the icon **121** first moves in the direction in which the icon **121** is assumed to move when, for example, the housing **110** is inclined, and then returns to the original position.

Furthermore, the arrangement of the icon **121** in the example shown in the drawing is just an example. In

addition, in the above example, all display positions of the icon **121** move to the right side of the display unit **120** so as to rebound on the inclination of the housing **110**, but the direction in which the display positions of the icon **121** moves is not limited thereto. For example, the display position of the icon **121** may move to the left side of the display unit **120** when there is the same inclination of the housing **110** as in the example shown in the drawing. Furthermore, it is needless to say that the direction in which the display position of the icon **121** moves is determined according to the direction in which the housing **110** is inclined.

In the portable terminal **100** that operates as above, the “movement of the display position of the icon **121**” that is the first display change that the display control unit **154** brings about to the display image in the embodiment is suppressed by the suppression control unit **155** due to a predetermined condition. In addition, while the movement of the display position of the icon **121** is suppressed as above, “the display position of the icon **121** moves first and returns” that is the second display change in the embodiment is executed by the display control unit **154**.

Herein, the predetermined condition with which the suppression control unit **155** suppresses the “movement of the display position of the icon **121**” that is the first display change may be, for example, acquisition of a user’s contact with the display unit **120** by the contact acquisition unit **152**. In addition, the predetermined condition may be that an angle  $\alpha$  of the inclination of the housing **100** is equal to or smaller than a predetermined threshold value. In addition, the predetermined condition may be setting of the portable terminal **100** so that a display change by inclination is nullified.

(Process in Portable Terminal)

FIG. **9** is a flowchart showing a process in the portable terminal **100** according to the second embodiment of the present disclosure. FIG. **9** shows a process of the portable terminal **100** according to the embodiment for executing a display change and a process according to the inclination of the housing **110** acquired by the inclination acquisition unit **151**. In the example shown in the drawing, a predetermined condition with which the suppression control unit **155** suppresses a movement of the display position of the icon **121** is acquisition of a user’s contact with the display unit **120** by the contact acquisition unit **152**.

First, in Step **S201**, the display control unit **154** determines whether or not the inclination of the housing **110** is acquired by the inclination acquisition unit **151**. When the inclination of the housing **110** is acquired here, the process advances to Step **S203**. On the other hand, when the inclination of the housing **110** is not acquired, the process returns to the start.

In Step **S203**, the suppression control unit **155** determines whether or not a user’s contact with the display unit **120** is acquired by the contact acquisition unit **152**. When the user’s contact with the display unit **120** is acquired here, the process advances to Step **S205**. On the other hand, when the user’s contact with the display unit **120** is not acquired, the process advances to Step **S107**.

In Step **S205**, the display control unit **154** causes the display position of the icon **121** to move first and to return. Furthermore, as described above, that the display position of the icon **121** moves first and returns is the second display change that the display control unit **154** brings about to the display image.

Furthermore, since the process of Steps **S107** to **S111** is the same as that in the first embodiment described above

referring to the same reference numerals in FIG. **4** detailed description thereof is omitted.

When the user’s contact with the display unit **120** is acquired by the contact acquisition unit **152** in the above process of the portable terminal **100**, the same second display change of “the display position of the icon **121** is caused to move first and return” is executed instead of executing the first display change of the “movement of the display position of the icon **121**” that the display control unit **154** brings about to the display screen. In other words, when the user’s contact with the display unit **120** is acquired by the contact acquisition unit **152**, the second display change of “the display position of the icon **121** is caused to move first and return” is executed while the first display change of the “movement of the display position of the icon **121**” is suppressed.

(Summary of Second Embodiment)

In the second embodiment of the present disclosure described above, the portable terminal **100** is further provided with the contact acquisition unit **152** which acquires a user’s contact with the LCD **120**, and the suppression control unit **155** suppresses the first display change when the contact is acquired.

As described above, in the embodiment, the first display change is a movement of the display position of the icon **121** that is an object included in an image displayed on the LCD **120**. The second display change is that the display position of the icon **121** is caused to move first and return.

With the configuration, for example, when a user performs a contact operation to the icon **121** displayed on the LCD **120** of the portable terminal **100**, a movement of the display position of the icon **121** by inclination of the housing **110** is suppressed. For that reason, even when the user who is performing the contact operation inclines the housing **110** without intention, it is possible to prevent an erroneous operation resulting from the movement of the display position of the icon **121**. In addition, it is possible to intentionally suppress a movement of the display position of the icon **121** by inclination of the housing **110** in a way that the user contacts an area where the background **123** is displayed and an operation instruction to the portable terminal **100** is not given even with a user’s contact. For example, when the user changes a way of holding the portable terminal **100**, it is possible to prevent an unintended movement of the display position of the icon **121** caused by inclination of the housing **110** when the way of holding is changed, by changing the way of holding while contacting the area where the background **123** is displayed.

### 3. Third Embodiment

Subsequently, a third embodiment of the present disclosure will be described. Furthermore, since the configuration of the portable terminal **100** and the display change that the display control unit **154** brings about to the display screen in the third embodiment are substantially the same as those in the first embodiment, detailed description thereof will be omitted.

(Process in Portable Terminal)

FIG. **10** is a flowchart showing a process in the portable terminal **100** according to the third embodiment of the present disclosure. FIG. **10** shows a process of the portable terminal **100** according to the present disclosure for executing a display change and a process according to inclination of the housing **110** acquired by the inclination acquisition unit **151**. In the example shown in the drawing, when the duration of a user’s contact with the display unit **120** is equal

to or longer than the second threshold value, the contact acquisition unit **152** acquires the contact as a long-pressing operation.

First, in Step **S301**, the contact acquisition unit **152** determines whether or not the continued contact of the user with the display unit **120** is detected by the touch panel **130**. When the continued contact of the user with the display unit **120** is detected here, the process advances to Step **S303**. On the other hand, when the continued contact of the user with the display unit **120** is not detected, the process advances to **S309**.

In Step **S303**, the inclination acquisition unit **151** records the angle of the inclination of the housing **110** at the time as a reference angle.

Successively in Step **S305**, the contact acquisition unit **152** determines whether or not the duration of the user's contact with the display unit **120** that has been detected by the touch panel **130** is equal to or longer than the second threshold value. When the duration of the user's contact with the display unit **120** is equal to or longer than the second threshold value, the process advances to Step **S307**. On the other hand, when the duration of the user's contact with the display unit **120** does not satisfy the second threshold value, the process advances to Step **S309**.

In Step **S307**, the CPU **150** executes a process corresponding to a long-pressing operation of the display unit **120** acquired by the contact acquisition unit **152**. The process can be a process relating to other kinds of process that the portable terminal **100** can execute, for example, voice calling, network communication, music and video reproduction, capturing moving and still images, or the like, in addition to a process of a display change by the display control unit **154**.

In Step **S309**, the suppression control unit **155** determines whether or not the angle of the inclination of the housing **110** acquired by the inclination acquisition unit **151** is equal to or smaller than the first threshold value. When the angle of the inclination of the housing **110** is equal to or smaller than the first threshold value, the process advances to Step **S305**, and determines again whether or not the duration of the user's contact with the display unit **120** is equal to or longer than the second threshold value. On the other hand, when the angle of the inclination of the housing **110** exceeds the first threshold value, the process advances to Step **S107**.

Furthermore, the process of Steps **S107** to **S111** is substantially the same as the process in the first embodiment described above referring to the same reference numerals in FIG. **4**, detailed description thereof will be omitted.

In the process of the portable terminal **100**, when the angle of the inclination of the housing **110** acquired by the inclination acquisition unit **151** is equal to or smaller than the first threshold value, acquisition of the user's continued contact with the display unit **120** by the contact acquisition unit **152** continues, and when the duration of the contact is equal to or longer than the second threshold value, the contact acquisition unit **152** acquires the contact as a long-pressing operation. On the other hand, when the angle of the inclination of the housing **110** exceeds the first threshold value before the duration of the contact is equal to or longer than the second threshold value, a process corresponding to the inclination of the housing **110** is executed. In this case, the contact that the contact acquisition unit **152** acquires is not acquired by a long-pressing operation. In other words, when the angle of the inclination of the housing **110** exceeds the first threshold value, the acquisition of the long-pressing operation by the contact acquisition unit **152** is suppressed,

instead of cancelling suppression of the "movement of the display position of the icon **121**" that is the first display change.

(Summary of Third Embodiment)

In the third embodiment of the present disclosure described above, the portable terminal **100** further includes the contact acquisition unit **152** which acquires contact when the duration of the user's contact with the LCD **120** is equal to or longer than the second threshold value, as a long-pressing operation, and the suppression control unit **155** suppresses the acquisition of long-pressing operation when the acquired angle of inclination of the housing **110** exceeds the first threshold value before the duration of the acquired contact is equal to or longer than the second threshold value.

As described above, in the embodiment, the first display change is a movement of the display position of the icon **121** that is an object included in the image displayed on the LCD **120**.

With the configuration, for example, when the angle of the inclination of the housing **110** exceeds a predetermined threshold value in which the display position of the icon **121** starts moving before the duration of the user's contact operation to the icon **121** displayed on the LCD **120** of the portable terminal **100** exceeds the predetermined threshold value with which the operation is determined to be a long-pressing operation, acquisition of the user's contact operation is cancelled. For that reason, even when the user performing a long-pressing operation for the icon **121** unintentionally inclines the housing **110**, it is possible to prevent an erroneous operation caused by moving the display position of the icon **121**.

#### 4. Fourth Embodiment

Subsequently, a fourth embodiment of the present disclosure will be described. Furthermore, since the configuration of the portable terminal **100** in the fourth embodiment is substantially the same as that in the first embodiment, detailed description thereof will be omitted.

(Operation of Portable Terminal)

FIG. **11** is a diagram showing an operation example of the portable terminal **100** according to the fourth embodiment of the present disclosure. FIG. **11** shows changes in the display position of the icon **121** in the state where the housing **110** of the portable terminal **100** is not inclined, where the angle of the inclination is an angle  $\alpha$  when the housing is inclined and a movement operation (flicking operation) on the touch panel **130** is performed, and where operations of movement and inclination are ended.

The LCD **120** displays the screen of the received e-mail list. The screen of the received e-mail list includes a deletion mark **121a** for selecting an e-mail to be deleted, and a delete button **121b**. In the state where the housing **110** is not inclined, however, the deletion mark **121a** and the delete button **121b** are not displayed on the LCD **120**. Furthermore, the deletion mark **121a** and the delete button **121b** are objects that can be displayed on the LCD **120** in the embodiment.

Herein, when a user inclines the housing **110** by the angle  $\alpha$  and performs a movement operation (flicking operation) for the touch panel **130** to the right direction of the LCD **120**, the screen of the received e-mail list displayed on the LCD **120** moves to the right side of the LCD **120**, and the deletion mark **121a** appears from the left edge of the LCD **120**.

The deletion mark **121a** is displayed on the left edge of the LCD **120** in a state where the above operation is ended. The user can switch a selection state and a non-selection

19

state of, for example, the deletion mark **121a** by contacting a portion of the deletion mark **121a** of the touch panel **130**.

Furthermore, in the embodiment, the suppression control unit **155** suppresses a movement of the display position of the deletion mark **121a** by the display control unit **154** when the contact acquisition unit **152** does not acquire the movement operation of the user to the touch panel **130** even when the inclination of the housing **110** is acquired by the inclination acquisition unit **151**.

In the portable terminal **100** that operates as above, a “movement of the display position of the deletion mark **121a**” that is a first display change that the display control unit **154** brings about to the display image in the embodiment is suppressed in cases other than the case where contact acquired by the contact acquisition unit **152** is a movement operation (flicking operation) of the deletion mark **121a**. Furthermore, the delete button **121b** can be displayed on the LCD **120** in the same manner as the deletion mark **121a** by inclining the housing **110** in, for example, the opposite direction to the example shown in the drawing and performing a movement operation through the touch panel **130**. (Summary of Fourth Embodiment)

In the fourth embodiment of the present disclosure described above, the portable terminal **100** further includes the contact acquisition unit which acquires a user’s contact with the LCD **120** as an operation instruction, and the suppression control unit **155** suppresses the first display change in cases other than a case where the acquired contact is a movement operation for an object.

As described above, in the embodiment, the first display change is a movement of the display position of the icon **121** that is an object included in the image displayed on the LCD **120**.

The configuration can be applied to, for example, a case where objects such as the deletion mark **121a**, the delete button **121b** of content, and the like, an erroneous operation of which causes a significant influence are included in the screen displayed on the LCD **120**. In this case, the objects including the deletion mark **121a** are arranged at first outside the area displayed on the LCD **120**. When a user inclines the housing **110**, and then performs a movement operation (flicking operation) through the touch panel **130**, the display position of the deletion mark **121a** is moved and the deletion mark appears on the LCD **120**. In other words, with simple inclination of the housing **110**, the display position of the deletion mark **121a** is not moved, and the display area on the LCD **120** that the user can operate does not appear. Therefore, it is possible to prevent erroneous operations caused by inclination of the housing **110** that the user does not intend for the objects such as the deletion mark **121a**, an erroneous operation of which causes a significant influence.

#### 5. Fifth Embodiment

Subsequently, a fifth embodiment of the present disclosure will be described. Furthermore, since the configuration of the portable terminal **100**, operations and processes relating to display in the fifth embodiment is substantially the same as those in the first embodiment, detailed description thereof will be omitted.

In the fifth embodiment of the present disclosure described above, when shaking of the housing **110** is acquired by the shaking acquisition unit **153** of the portable terminal **100** shown in FIG. 1, the display control unit **154** acquires the angle of the inclination of the housing **110** acquired by the inclination acquisition unit **151** at that time as a reference angle of the inclination of the housing **110**.

20

With the configuration, a user can perform an operation of inclining the portable terminal **100** even when an operating posture of the user is changed, with a reference of a state where the portable terminal **100** is positioned in front of the user by performing an action of, for example, shaking the portable terminal **100**.

#### 6. Supplement

Hereinabove, exemplary embodiments of the present disclosure have been described in detail with reference to accompanying drawings, but the present disclosure is not limited thereto. It is clear that any person who has general knowledge in the technical field to which the present disclosure belongs can achieve various modified examples and amended examples within the category of the technical gist described in the claims, and it is understood that the examples certainly belong to the technical range of the present disclosure.

For example, in each of the embodiments above, a portable terminal is described as an example of an information processing device, but the present disclosure is not limited to the example. The information processing device can be all devices, for example, a tablet PC (Personal computer), a portable game device, and the like, that have display units and a user can incline.

In addition, for example, in each of the embodiments above, a movement of the display position of an object included in an image is exemplified as a display change for the image displayed on a display unit, but the present disclosure is not limited to the example. The object, for example, may rotate without moving the display position, or may appear or be erased without moving the display position.

The present disclosure contains subject matter related to that disclosed in Japanese Priority Patent Application JP 2010-263408 filed in the Japan Patent Office on Nov. 26, 2010, the entire content of which is hereby incorporated by reference.

It should be understood by those skilled in the art that various modifications, combinations, sub-combinations and alterations may occur depending on design requirements and other factors insofar as they are within the scope of the appended claims or the equivalents thereof.

What is claimed is:

1. An information processing apparatus, comprising: at least one processor configured to:
  - acquire a touch input from a touch sensor of a portable terminal;
  - acquire, from an acceleration sensor of the portable terminal, inclination information of the portable terminal;
  - control a display unit of the portable terminal to display a first object and a second object associated with the first object;
  - determine, based on the touch input and the inclination information, whether the portable terminal is in a first state a second state, or a third state, wherein
    - in the first state, a duration of the touch input is lower than a time threshold value and angle of inclination of the portable terminal is lower than an angle threshold value,
    - in the second state, the duration of the touch input is lower than the time threshold value and the angle of inclination of the portable terminal is equal to or larger than the angle threshold value, and

21

in the third state, the duration of the touch input is equal to or larger than the time threshold value;

control, based on the determination that the portable terminal is in the first state, the display unit to execute a first inclination process to move a second image toward an edge of the display unit while suppressing movement of a first image;

control, based on the determination that the portable terminal is in the second state, the display unit to execute a second inclination process to move the first image; and

control, based on the determination that the portable terminal is in the third state, the display unit to execute a long-touch process different from each of the first inclination process and the second inclination process.

2. The information processing apparatus according to claim 1,

wherein the at least one processor is further configured to record an angle of the portable terminal when the touch sensor detects the touch input; and

determine, based on the touch input and the inclination information with respect to the recorded angle, whether the portable terminal is in the first state, the second state, or the third state.

3. An information processing method, comprising:

in a portable terminal:

- acquiring a touch input from a touch sensor of the portable terminal;
- acquiring, from an acceleration sensor of the portable terminal, inclination information of the portable terminal,
- controlling a display unit of the portable terminal to display a first object and a second object associated with the first object;
- determining, based on the touch input and the inclination information, whether the portable terminal is in a first state, a second state, or a third state, wherein in the first state, a duration of the touch input is lower than a time threshold value and angle of inclination of the portable terminal is lower than an angle threshold value,
- in the second state, the duration of the touch input is lower than the time threshold value and the angle of inclination of the portable terminal is equal to or larger than the angle threshold value, and
- in the third state, the duration of the touch input is equal to or larger than the time threshold value;

controlling, based on the determination that the portable terminal is in the first state, the display unit to execute a first inclination process to move a second

22

image toward an edge of the display unit while suppressing movement of a first image;

controlling, based on the determination that the portable terminal is in the second state, the display unit to execute a second inclination process to move the first image; and

controlling, based on the determination that the portable terminal is in the third state, the display unit to execute a long-touch process different from each of the first inclination process and the second inclination process.

4. A non-transitory computer-readable medium having stored thereon computer-executable instructions which, when executed by a portable terminal, cause the portable terminal to execute operations, the operations comprising:

- acquiring a touch input from a touch sensor of the portable terminal;
- acquiring, from an acceleration sensor of the portable terminal, inclination information of the portable terminal,
- controlling a display unit of the portable terminal to display a first object and a second object associated with the first object;
- determining, based on the touch input and the inclination information, whether the portable terminal is in a first state, a second state, or a third state, wherein in the first state, a duration of the touch input is lower than a time threshold value and angle of inclination of the portable terminal is lower than an angle threshold value,
- in the second state, the duration of the touch input is lower than the time threshold value and the angle of inclination of the portable terminal is equal to or larger than the angle threshold value, and
- in the third state, the duration of the touch input is equal to or larger than the time threshold value;

controlling, based on the determination that the portable terminal is in the first state, the display unit to execute a first inclination process to move a second image toward an edge of the display unit while suppressing movement of a first image;

controlling, based on the determination that the portable terminal is in the second state, the display unit to execute a second inclination process to move the first image; and

controlling, based on the determination that the portable terminal is in the third state, the display unit to execute a long-touch process different from each of the first inclination process and the second inclination process.

\* \* \* \* \*